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Modern View on the Theory of Channels, Collaterals, and Organs

Mikhail Teppone, MD and Romen Avakyan, PhD

ABSTRACT

The theory of Channels, Collaterals, and Organs is one of the most important but at the same time, one of the most difficult in Traditional Chinese Medicine (TCM). Do we need to preserve the original TCM lingo or is it possible to match the TCM terms with their equivalents in modern medicine? The authors review the main ideas about Channels and Organs theory and provide their own explanation.

We believe that ancient Chinese doctors understood the complexity of the human body and divided it into 2 morpho-funcional parts: cells and intercellular spaces. Through the theory of "Channels and Collaterals," those physicians described physiology and pathology of intercellular spaces and by the theory of "Zang and Fu Organs," they described cellular physiology and pathology.

Key Words: Channels, Collaterals, Meridians, Organs, Cells, Intercellular Space

INTRODUCTION

In the developed Western countries, people are increasingly aware of different types of alternative medicine. Despite the growing interest, alternative medicine has not yet been integrated into the mainstream healthcare system. Therefore, still remaining are 2 separate forms of medical practice, Modern Western and Traditional Eastern or Chinese medicine.

No doubt perhaps, the future of medicine lies in the integration of modern technology and the extensive wisdom and experience of Eastern healing methodology. The main obstacle for such integration is the difference of views on the nature of human organism, methods of diagnosing and treatment, as well as vague terms used in Traditional Chinese Medicine (TCM).

Do we need to preserve the original TCM lingo or is it possible to match the TCM terms with their equivalents in modern medicine? Can we apply such terms as Yin and Yang, Five Elements, Excess/Deficiency, Heat, and Wind interchangeably with those of sympathetic and parasympathetic nervous systems, various hormones, endorphins? After reading, our hope is that vague and unknown words will take on a new, deeper meaning in relation to the universal laws of nature and human development. Our desire is that TCM will become vital and accepted in the modern Western world.

According to the TCM theory of energy, Qi circulates through the human body via special pathways known as *Channels* and *Collaterals.* This process supports normal organ and body functions. When disease occurs, the cause may be internal (hereditary or congenital Qi disorders, strong emotions, etc) or external (Wind, Heat, Cold, etc). Pathological conditions in TCM can be attributed to abnormal circulation of Qi and blood, which results in a state of excess or deficiency of organs and channels. Therapeutic methods used in TCM restore balance of Qi and blood between various points in the body.

MATHEMATICAL MODEL OF THE HUMAN BODY

The terms used in TCM first appeared in the ancient oriental philosophy and have very broad meanings. Modern science, on the contrary, employs terms with precise and exact definitions. Therefore, any attempt at literal translation of TCM terms into modern language directly would result in a loss of meaning and essence of that particular term.

TCM theory can be represented as a simple mathemati-

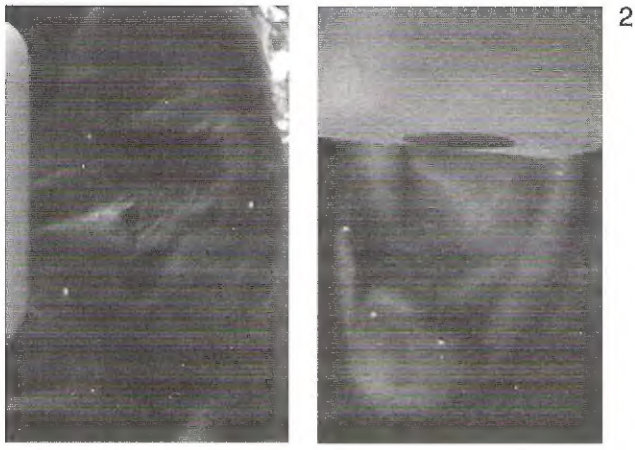

FIG. 1. White spots on the ears as a result of stimulated luminescence on the dielectric medium above low electrical resistance points. There is a left ear of the living man (**1**) and there is a left ear of the corpse: one day after death (**2**).

cal model which would show the relationship between physiological and pathological laws of human organism. When we apply this model, where TCM terms and principles resemble elements of algebraic equation, we can understand an individual patient problem and find specific treatment approach. This is also true in cases of unknown etiology and pathogenesis where diagnosis and treatment are yet to be developed.

ACUPOINTS

The skin of both human and animal is characterized by morphological and functional heterogeneity. The same is true for bodies of plants and insects.[1,2] In TCM, this heterogeneity is described as Acupoints, Skin Zones, Channels, and Collaterals.

Some publications on acupoints argue that there are no unusual morphological elements at the site of acupoints. Loose connective tissue with large numbers of nerve receptors, free nerve endings, extensive microcirculatory system, and cells with biologically active substances form the morphological basis for acupoints and intercellular connections, which include gap junctions. Gap junctions are microscopic water channels that directly supply exchange of broad spectrum of nutrients between cytoplasm of tissue cells.[3–7]

Skin resistance varies from one to two Mega-ohms, but at the site of acupoint entrance, it decreases to 20–60 Kilo-ohms.[8–11] Due to low resistance of skin at the site of acupoints, one may visualize them by a high voltage corona discharge device. Disruption of the electrical field has the highest value above low electric resistance points of the skin. At these areas, stimulated luminescence is observed on the dielectric medium (Figure 1).[12]

Besides electrical heterogeneity, acupoints have other specific characteristics such as low frequency oscillations (7–10 and 15–20 Hz),[13] spontaneous visible light emission,[14] increased accumulation of radioactive phosphorus,[15] increased sensitivity to high frequency electromagnetic radiation,[16,17] high conductivity or natural electromagnetic radiation from the sun,[18] etc.

This electrical heterogeneity of skin can still be detected during the first few days after death.[2,19–21] However, due to autolytic processes occurring in the cell post mortem, the physical parameters of skin gradually equalize and electrical heterogeneity disappears.

Taking into account the above information—as well as the Chinese term for acupoint, *kong xue*, which means fissure or crevice—we can conclude that acupoints are places in the skin where connections between the epithelial cells are not tight, thus providing an entrance into the body. The site of acupoints contains large numbers of active elements, which make it a complex functional unit that provides interaction between internal body environments with its external surrounding (Figure 2).

SYSTEM OF CHANNELS AND COLLATERALS

Qi and blood circulate in the human body along Channels and Collaterals. There are 12 main channels and their secondary vessels which supply normal function and defense of the human body by means of circulating Qi and blood. Secondary vessels include Tendino-Muscular Channels, Luo Channels or Collaterals, Divergent Channels, and Curious or Extra Channels (Figure 3). Currently, there are 2 different views on channels. First, the channels themselves are non–existent; an imaginary line called ⟨⟨meridian⟩⟩ connects

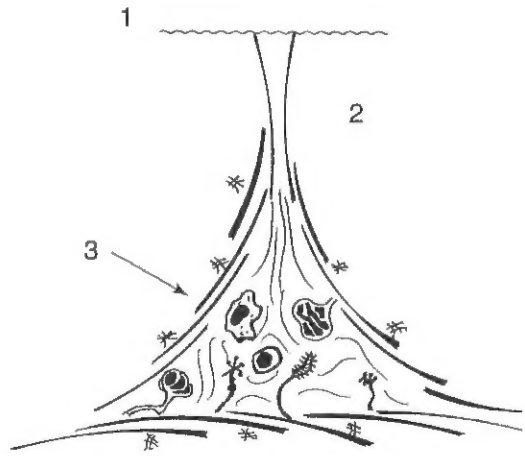

FIG. 2. There is a suggested scheme of acupoints: (**1**) Skin surface; (**2**) "Channel" of the acupoint; (**3**) Various elements of the "active zone" of the acupoint.

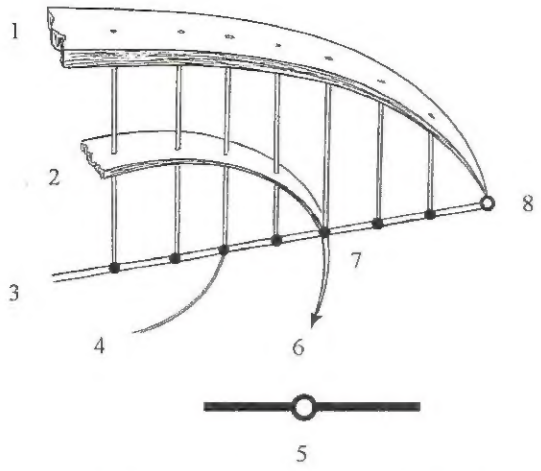

FIG. 3. Structure of Channels and Collaterals (*Jing* & *Luo*): (**1**) Tendino-Musclular Channel; (**2**) Luo-Channel or Collateral; (**3**) Regular or Main Channel; (**4**) Divergent Channel; (**5**) *Yuan* (Source) Point of the paired Channel; (**6**) Luo-Transversal Vessel; (**7**) *Luo* - Point; (**8**) *Ting* (Well) - Point.

functionally similar points; true connection between points is achieved through the function of the nervous and endocrine systems.[22,23]

Second, experimental data suggest the presence of a morphological relationship between the points of the same channel. For example, during acupuncture, the conduction along exact pathways of sensory reactions,[24] electrical current,[25,26] warmth,[27] visible light,[28] and radioactive isotopes[29] take place.

The modern science approach suggest the presence of correlation between structure and function of a biological object. Presently, no specific structure has been found to identify the channels. But, sometimes the absence of structures can make way for a new function. For example, the "door or window aperture," "river bed," or "gap" all provide conduction or passage.

The main function of the channels is to *conduct:* electrical current, warmth, light, etc so that Qi travels along the channel. Channels can best be described as a network of gaps stretching along the well known anatomical structures. The inner channel walls are formed by the surfaces of muscles, bones, tendons, vessels, and cells. These channels are filled with fibrous connective tissue, electrolytes, and structured water molecules.[30,31] We presume that to be sufficient to ensure Qi conduction.

This theory is supported by the research of Korean physician Kim Bon Chan[32] as well as the description found in the ancient book of the famous Chinese physician, Li Shi Zhen: "the inside of a human body contains tunnels and one, who mentally looks within self, can illuminate them."[33]

Experimental data reveal that informational interaction between cells is achieved through the electromagnetic field at the range of 1×10^{10} Hz.[28,34] From physics, we know that only wave-guides or dielectric wave-guides can conduct these high frequency waves. Impulses of relatively low frequency are conducted by the nervous system, but high frequency signals are conducted by the system of "gaps" or wave-guides. Thus, the channels are the only possible entities that can transmit high frequency impulses produced by cells. Theoretical and experimental data show that channels can act as weave-guides to conduct electromagnetic waves of various ranges.[1,28]

Possibly, channels and collaterals form the oldest independent regulatory system of humans and animals.[35–37] Morphological simplicity of channels is the reason why they have not been identified. In the words of a biologist, "channel system is too primitive in a view of modern biology."[38] Though basic, the channel system connects other more complex regulatory systems and provides interaction of inner organs with outside environment.

Based on the above, we can conclude that by using the theory of channels and collaterals, ancient Chinese doctors described physiology and pathology of intercellular spaces and body cavities (Figure 4).[39]

One may attempt to find correlation between channels, secondary vessels, and intercellular spaces of various anatomical structures, but this correlation would be more functional than anatomical. Depending on the disease and its sequence, disorders of organs and tissues can be linked to various channel structures. For example, in the event of inflammation of skin and subcutaneous tissue characterized by inflammatory symptoms such as localized redness, hyperthermia, hyperesthesia, edema, and pain exacerbated by pressure, this type of abnormality can be described as "Excess of the Tendino-Muscular" channel. If skin changes its integrity, as when a keloid scar or ulcer is present, this would point to a disorder of the *Luo* channel.

Governor Vessel is a typical example of the gap model of a channel. It originates in the kidney, extends down to

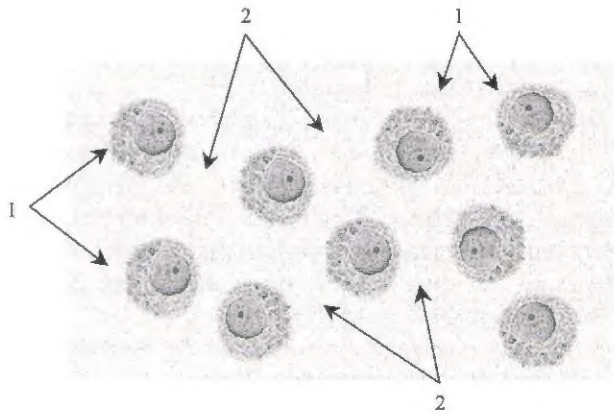

FIG. 4. Cells and intercellular spaces ("channels"). (**1**) Cells; (**2**) Intercellular Space.

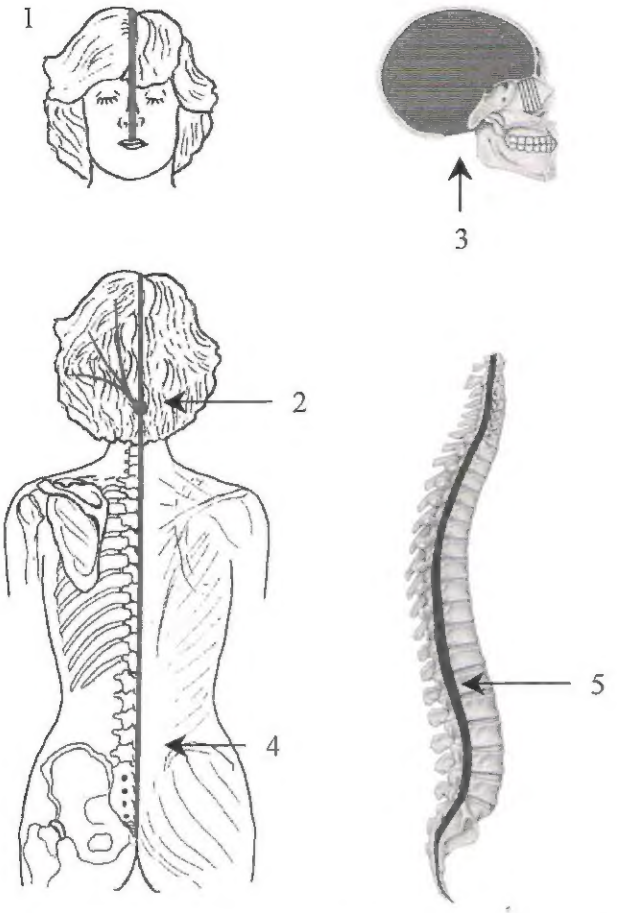

FIG. 5. There is a scheme of the Governor Vessel and a vertebral channel, which is an anatomical correlation of Governor Vessel. (**1**) The terminal pathway of Governor Vessel; (**2**) Internal branch of Governor Vessel begins at the point GV 16; (**3**) Point GV 16 (Fong Fu) corresponds to Foramen Magnum; (**4**) Governor Vessel; (**5**) Vertebral channel.

the perineum through the uterus or prostate gland, and then, one of the main branches ascends through the vertebral column. The point of GV 16 (Fong Fu) gives birth to the branch, which enters the skull. Its main pathway lies through the top of the head and ends at the upper lip.

What is an anatomical equivalent of the Governor Vessel: spinal chord or vertebral column? We believe that Governor Vessel is a vertebral channel; GV 16 (Fong Fu) corresponds to Foramen Magnum at the occipital bone. Therefore, the branch of Governor Vessel penetrating the skull is the extension of the vertebral channel into the skull through Foramen Magnum (Figure 5).

In much the same way, we can analyze Conception Vessel and describe its relationship to the chest, abdominal, and pelvic cavities. Therefore, both Governor and Conception Vessels are cavities themselves, regulating the function of their respective organs.

Hence, channels are not organs, tissues, or cells but various body cavities. This approach is not yet integrated in modern Western medicine.

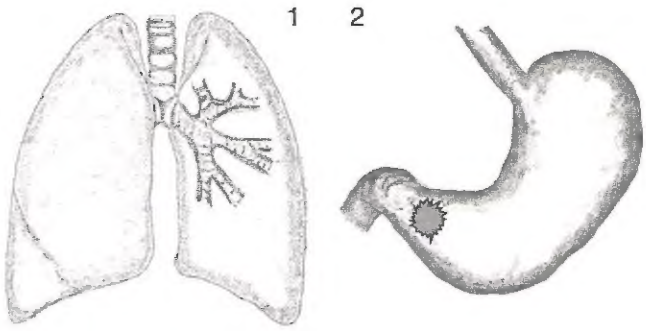

FIG. 6. Lung (Yin) with the Bronchus (Yang) inside (**1**) and Stomach (Yang) with a Stomach wall (Yin) outside (**2**). Peptic ulcer is localized at the Stomach wall, which belongs to the Spleen-Pancreas.

STRUCTURE AND FUNCTION OF ZANG (YIN) AND FU (YANG) ORGANS

TCM distinguishes 12 main organs in the human body: Lung, Spleen, Heart, Kidney, Liver, Pericardium, Stomach, Large Intestine, Small Intestine, Gallbladder, Bladder, and "Triple Energizer" (San Jiao). The first 6 belong to viscera or Zang (solid) organs; the other 6 belong to hollow or Fu (hollow) organs. These organs are divided into Yin-Yang related pairs, which form one of the Five Elements.

Zang or dense organs have inner cavities (bronchus, bile ducts, renal calyx, pelvis, etc and correspond to Fu or hollow organs (Figure 6). At the same time, Fu organs have solid walls, which correspond to the Zang organs (Figure 6).

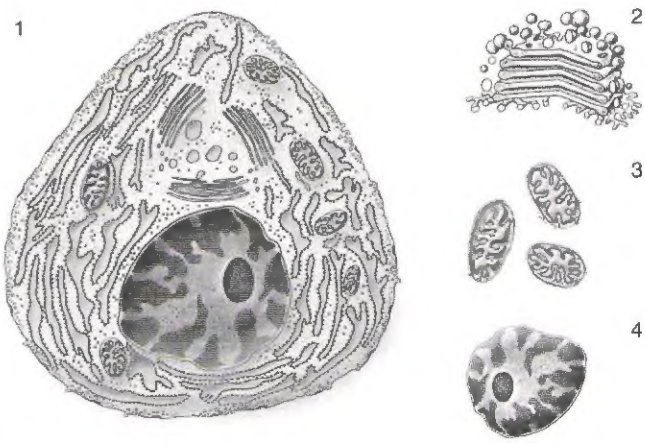

FIG. 7. Cells and organelles correspond to the Zang & Fu Organs (**1**): Golgi complex corresponds to the "Liver" (**2**), Mitochondria corresponds to the "Lungs" (**3**), nucleus corresponds to the "Kidneys" (**4**).

Thus, Zang organs contain Fu properties inside, and Fu organs contain Zang properties outside. Therefore, a renal calculus is actually located in the Bladder Channel and peptic ulcer will need treatment of the Spleen Channel.

The term *organ* in TCM involves much broader meaning than an anatomical formation. All cells contain standard components like nucleus, mitochondria, Golgi complex, endoplasmic reticulum, etc. Each organelle possesses certain inherent functions. Function of oxidative phosphorylation and synthesis of ATP molecules is carried out in mitochondria; synthesis and transport of proteins takes place in endoplasmic reticulum; Golgi complex is responsible for the accumulation of proteins, synthesis of polysaccharides, and more complex substances; the function of regulation of differentiation, development, and death of cells belongs to the nucleus (Figure 7).

In the majority of cells, it is possible to allocate the function of breathing, which corresponds to the lung; function of synthesis and storage of complex substance, which is appropriate for endocrine glands and the liver; and function of regulation of cell age, corresponding to the kidneys, etc.

Thus, the concept of organ in TCM includes the set of cellular and intracellular structures that carry out certain functions. For example, Lung involves all structures that facilitate diffusion and transport of gases (O_2 and CO_2) as well as oxidative phosphorylation and synthesis of ATP molecules. Therefore, regardless of the cause of "breathlessness" or shortness of breath from the modern perspective, the points on the channel of Lung are used to treat it.

DISCUSSION

Since the time acpuncture was introduced in the United States and Europe, discussion and debate about the nature of "acupoints," "channels," and "collaterals" has continued. There have been fewer questions about "organs," perhaps, because of appearing like classic organs from the modern point of view.

Scientific medicine made a large step ahead when R. Virchow claimed that disease was pathology of cells, but at the same time, any extracellular disorders were almost ignored or deemed "functional diseases." Conceivably, the conception of "cellular medicine" was a reason why Traditional Chinese Medicine's ideas about "holes," "channels," or "tunnels" distributed into the human body have been hard to become accepted.

Thus, the concept of *organ* in TCM includes the set of cellular and intracellular structures that carry out certain functions. For example, Lung involves all structures that facilitate diffusion and transport of gases (O_2 and CO_2) as well as oxidative phosphorylation and synthesis of ATP molecules. Therefore, regardless of the cause of "breathlessness" or shortness of breath from the modern perspective, the points on the channel of Lung are used to treat it.

CONCLUSIONS

We believe that ancient Chinese doctors understood the complexity of the human body and divided it into 2 morpho-functional parts: cells and intercellular spaces. Through the theory of "Channels and Collaterals," those ancients described physiology and pathology of intercellular spaces. By the theory of "Zang and Fu Organs," they described cellular physiology and pathology.[39]

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Address correspondence and reprint requests to:
Mikhail Teppone, MD, DAc
AcuTech International, Inc.
4866 Bathurst Street, Suite 508
North York, M2R 1X4
Canada

E-mail: teppone@rogers.com